FIG.1(a)

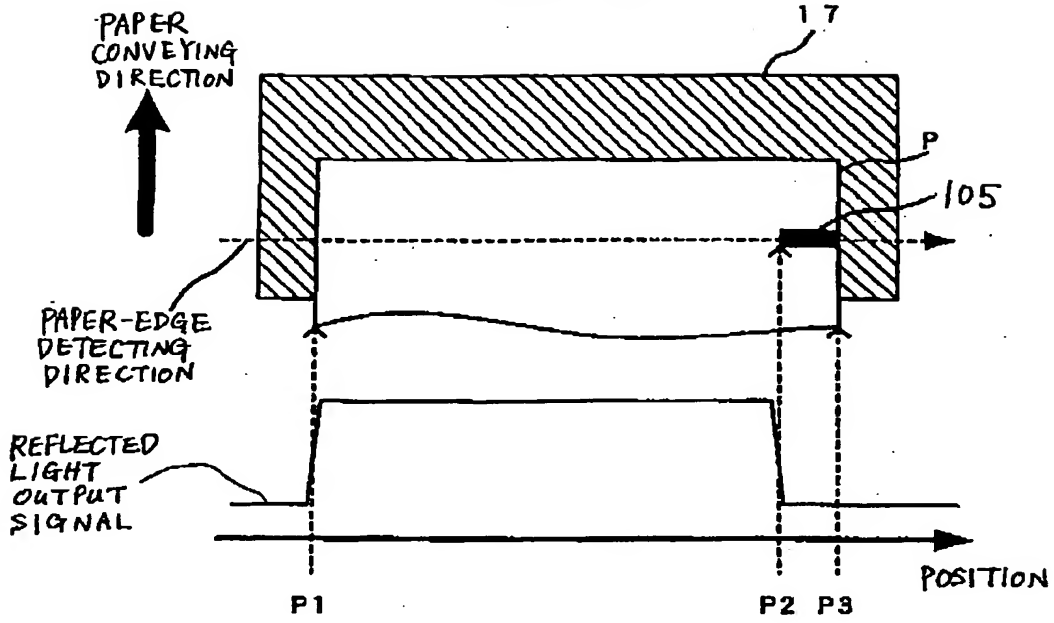
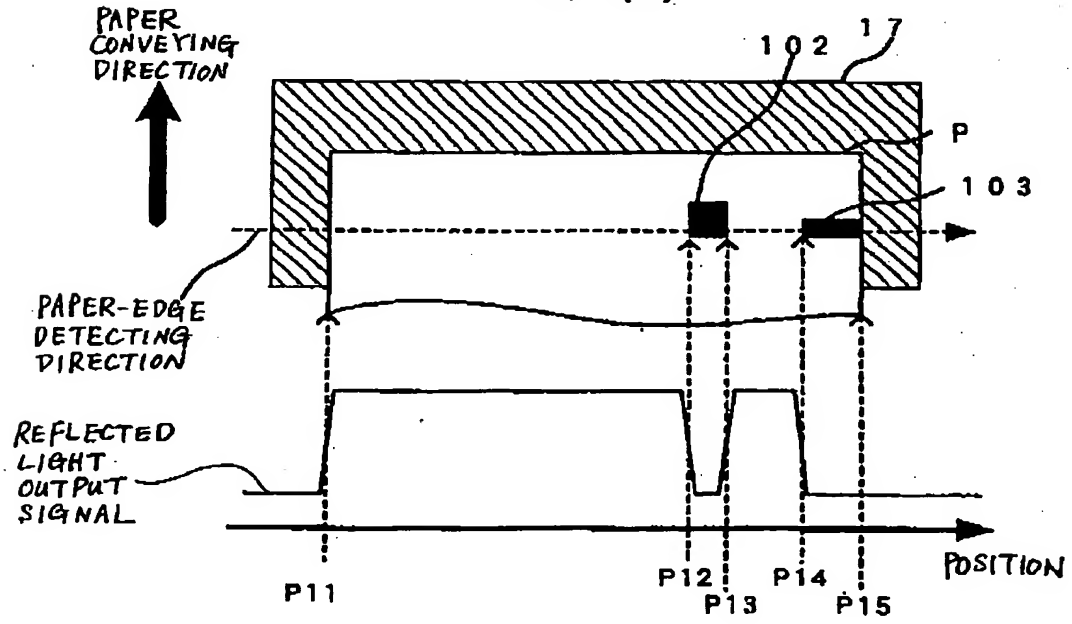

PAPER CONVEYING DIRECTION
17
P
105
PAPER-EDGE DETECTING DIRECTION
REFLECTED LIGHT OUTPUT SIGNAL
POSITION
P1
P2
P3

FIG.1(b)


PAPER CONVEYING DIRECTION
102
17
P
103
PAPER-EDGE DETECTING DIRECTION
REFLECTED LIGHT OUTPUT SIGNAL
POSITION
P11
P12
P13
P14
P15

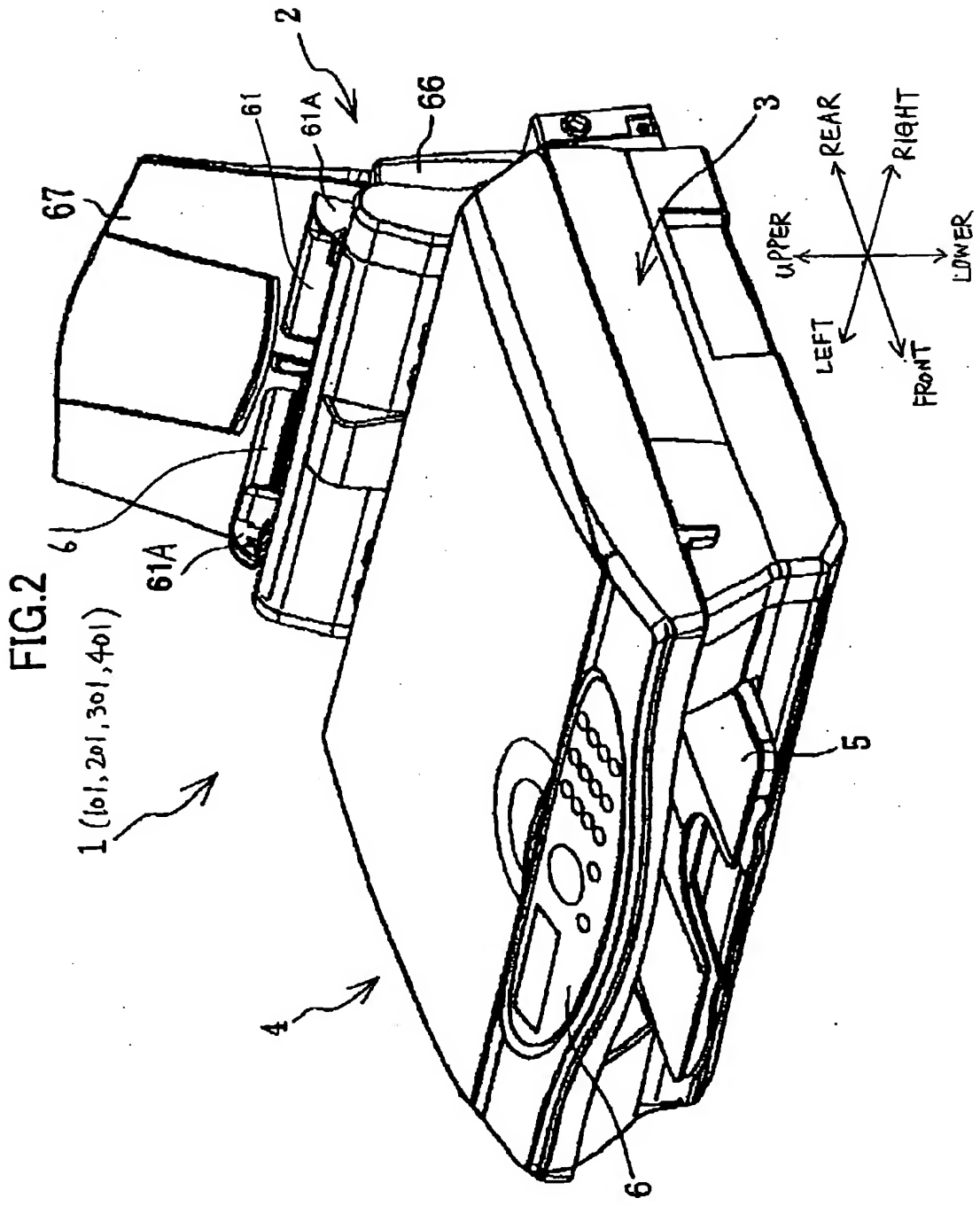

2
61
61A
66
67
3
REAR
RIGHT
UPPER
LOWER
LEFT
FRONT
61
61A
1 (101, 201, 301, 401)
4
5
6

FIG.2

FIG.3

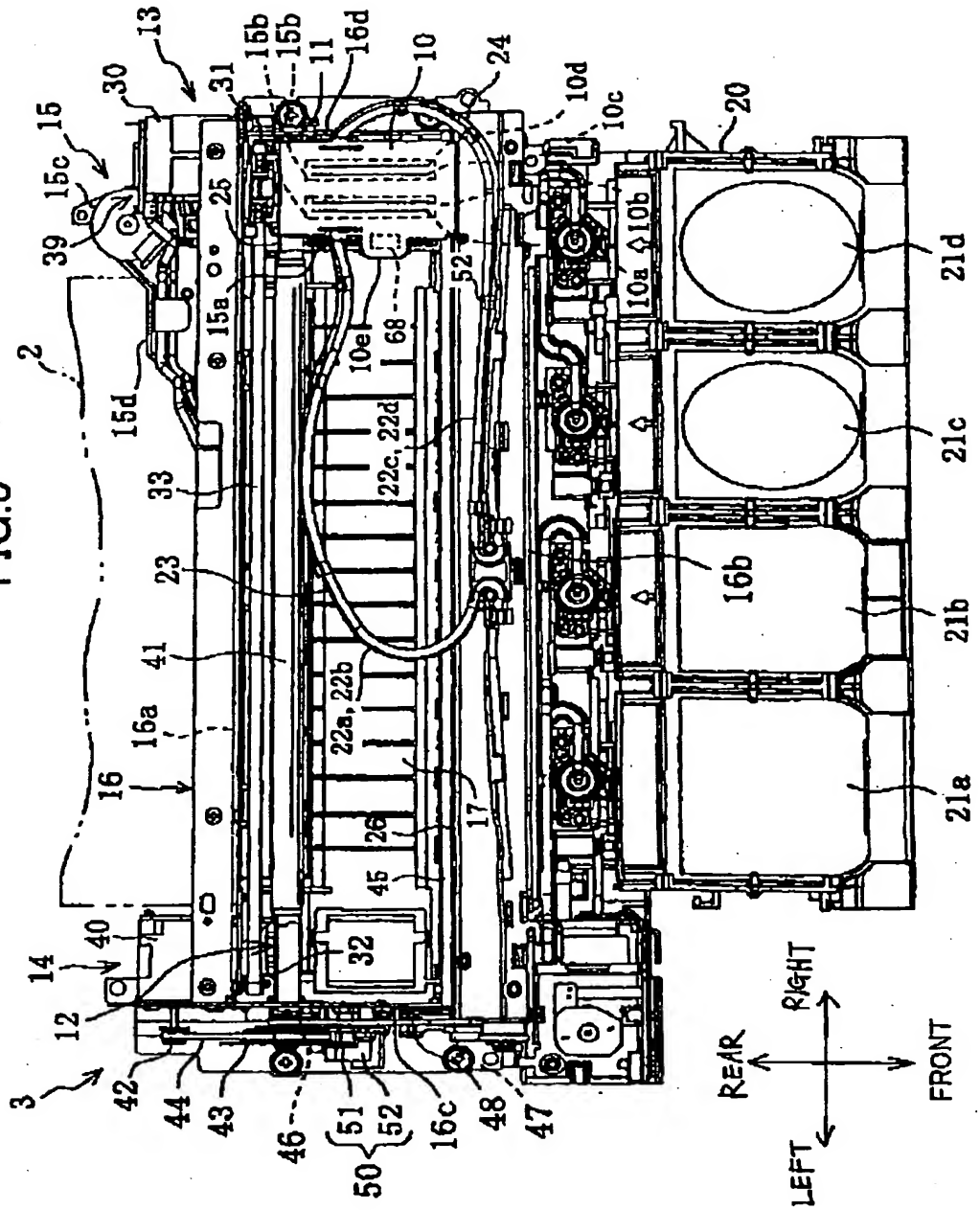

13
30
31
15b
15b
11
16d
10
24
10d
10c
20
15
15c
39
25
15a
52
10a
10b
21d
2
15d
10e
68
22c, 22d
21c
33
23
16b
21b
41
22a, 22b
16a
16
17
21a
26
45
40
32
14
12
3
42
44
43
46
51
52
50
16c
48
47
REAR
RIGHT
FRONT
LEFT

FIG.4

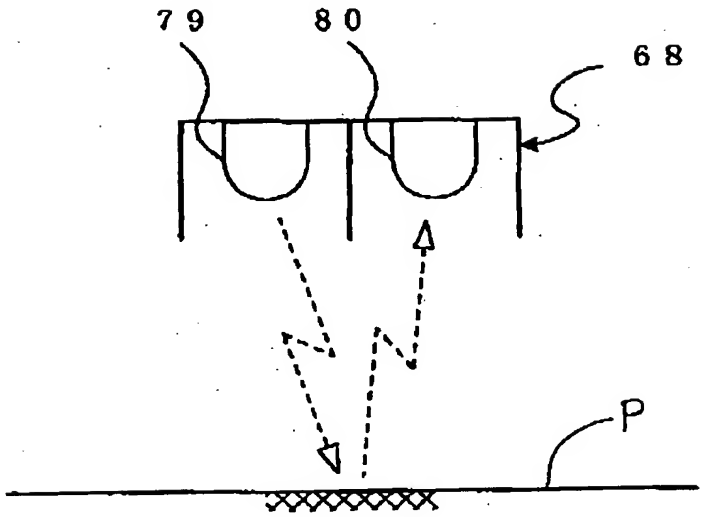


FIG.5

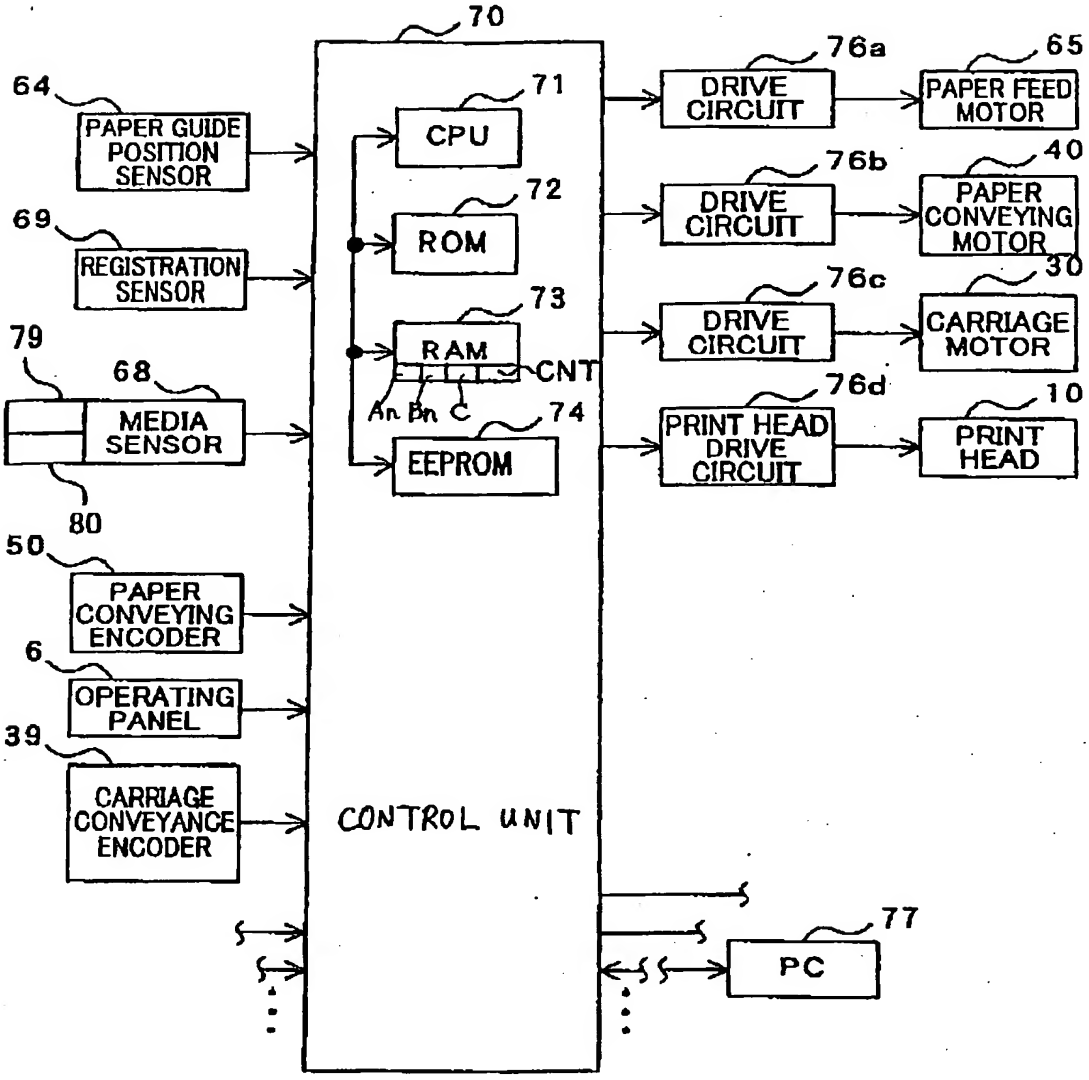

70
64
PAPER GUIDE POSITION SENSOR
69
REGISTRATION SENSOR
79
68
MEDIA SENSOR
80
50
PAPER CONVEYING ENCODER
6
OPERATING PANEL
39
CARRIAGE CONVEYANCE ENCODER
71
CPU
72
ROM
73
RAM
CNT
An Bn C
74
EEPROM
CONTROL UNIT
76a
DRIVE CIRCUIT
65
PAPER FEED MOTOR
76b
DRIVE CIRCUIT
40
PAPER CONVEYING MOTOR
76c
DRIVE CIRCUIT
30
CARRIAGE MOTOR
76d
PRINT HEAD DRIVE CIRCUIT
10
PRINT HEAD
77
PC

FIG.6

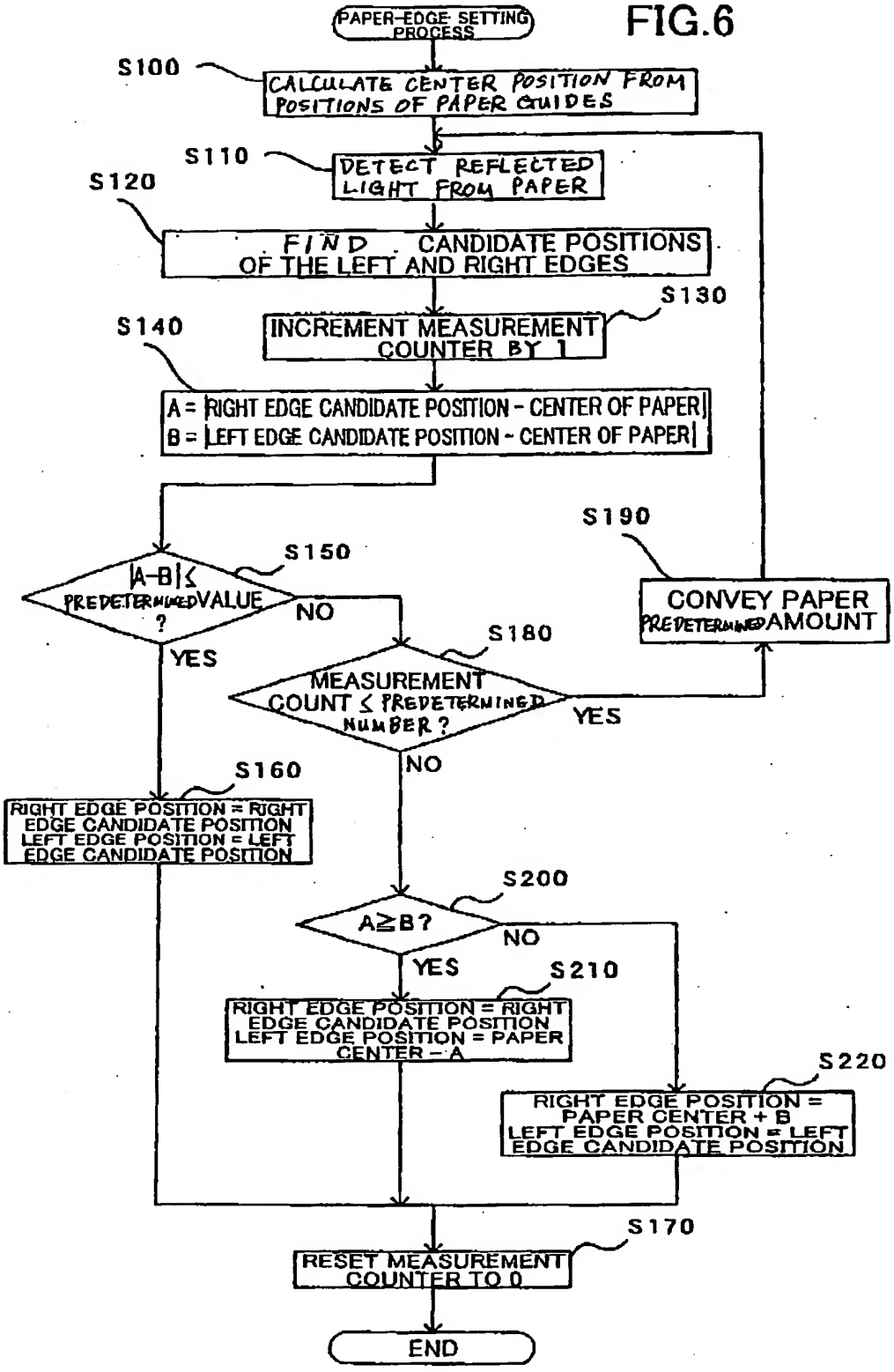

PAPER-EDGE SETTING PROCESS
S100
CALCULATE CENTER POSITION FROM POSITIONS OF PAPER GUIDES
S110
DETECT REFLECTED LIGHT FROM PAPER
S120
FIND CANDIDATE POSITIONS OF THE LEFT AND RIGHT EDGES
S130
INCREMENT MEASUREMENT COUNTER BY 1
S140
A = |RIGHT EDGE CANDIDATE POSITION - CENTER OF PAPER|
B = |LEFT EDGE CANDIDATE POSITION - CENTER OF PAPER|
S150
|A-B| ≤ PREDETERMINED VALUE ?
NO
YES
S180
MEASUREMENT COUNT ≤ PREDETERMINED NUMBER ?
YES
NO
S190
CONVEY PAPER PREDETERMINED AMOUNT
S160
RIGHT EDGE POSITION = RIGHT EDGE CANDIDATE POSITION
LEFT EDGE POSITION = LEFT EDGE CANDIDATE POSITION
S200
A≥B?
NO
YES
S210
RIGHT EDGE POSITION = RIGHT EDGE CANDIDATE POSITION
LEFT EDGE POSITION = PAPER CENTER – A
S220
RIGHT EDGE POSITION = PAPER CENTER + B
LEFT EDGE POSITION = LEFT EDGE CANDIDATE POSITION
S170
RESET MEASUREMENT COUNTER TO 0
END

FIG.7

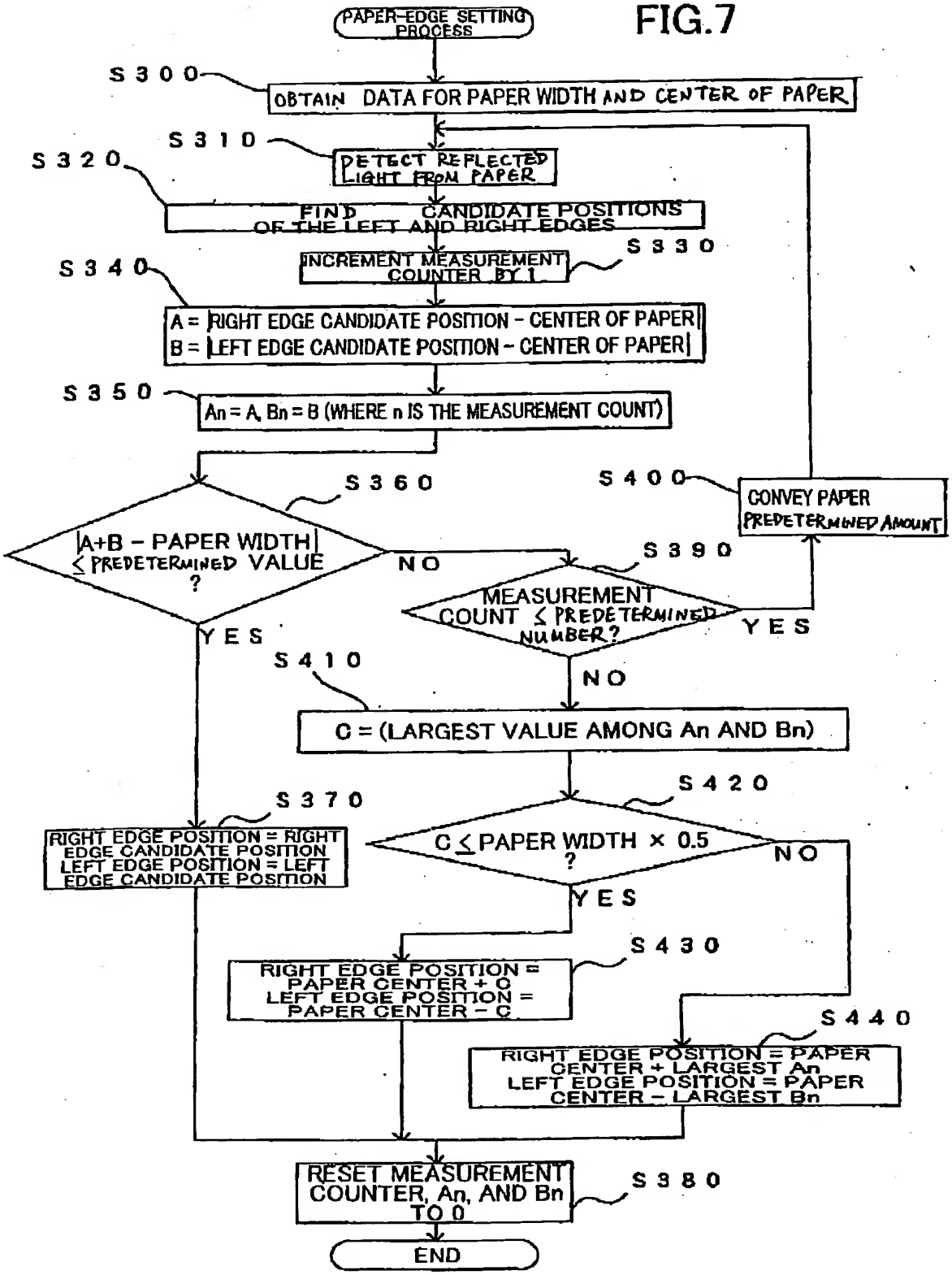

PAPER-EDGE SETTING PROCESS
S300
OBTAIN DATA FOR PAPER WIDTH AND CENTER OF PAPER
S310
DETECT REFLECTED LIGHT FROM PAPER
S320
FIND CANDIDATE POSITIONS OF THE LEFT AND RIGHT EDGES
S330
INCREMENT MEASUREMENT COUNTER BY 1
S340
A = |RIGHT EDGE CANDIDATE POSITION - CENTER OF PAPER|
B = |LEFT EDGE CANDIDATE POSITION - CENTER OF PAPER|
S350
An = A, Bn = B (WHERE n IS THE MEASUREMENT COUNT)
S360
|A+B - PAPER WIDTH| ≤ PREDETERMINED VALUE ?
NO
YES
S390
MEASUREMENT COUNT ≤ PREDETERMINED NUMBER?
YES
NO
S400
CONVEY PAPER PREDETERMINED AMOUNT
S410
C = (LARGEST VALUE AMONG An AND Bn)
S420
C ≤ PAPER WIDTH × 0.5 ?
NO
YES
S370
RIGHT EDGE POSITION = RIGHT EDGE CANDIDATE POSITION
LEFT EDGE POSITION = LEFT EDGE CANDIDATE POSITION
S430
RIGHT EDGE POSITION = PAPER CENTER + C
LEFT EDGE POSITION = PAPER CENTER - C
S440
RIGHT EDGE POSITION = PAPER CENTER + LARGEST An
LEFT EDGE POSITION = PAPER CENTER - LARGEST Bn
S380
RESET MEASUREMENT COUNTER, An, AND Bn TO 0
END

FIG.8

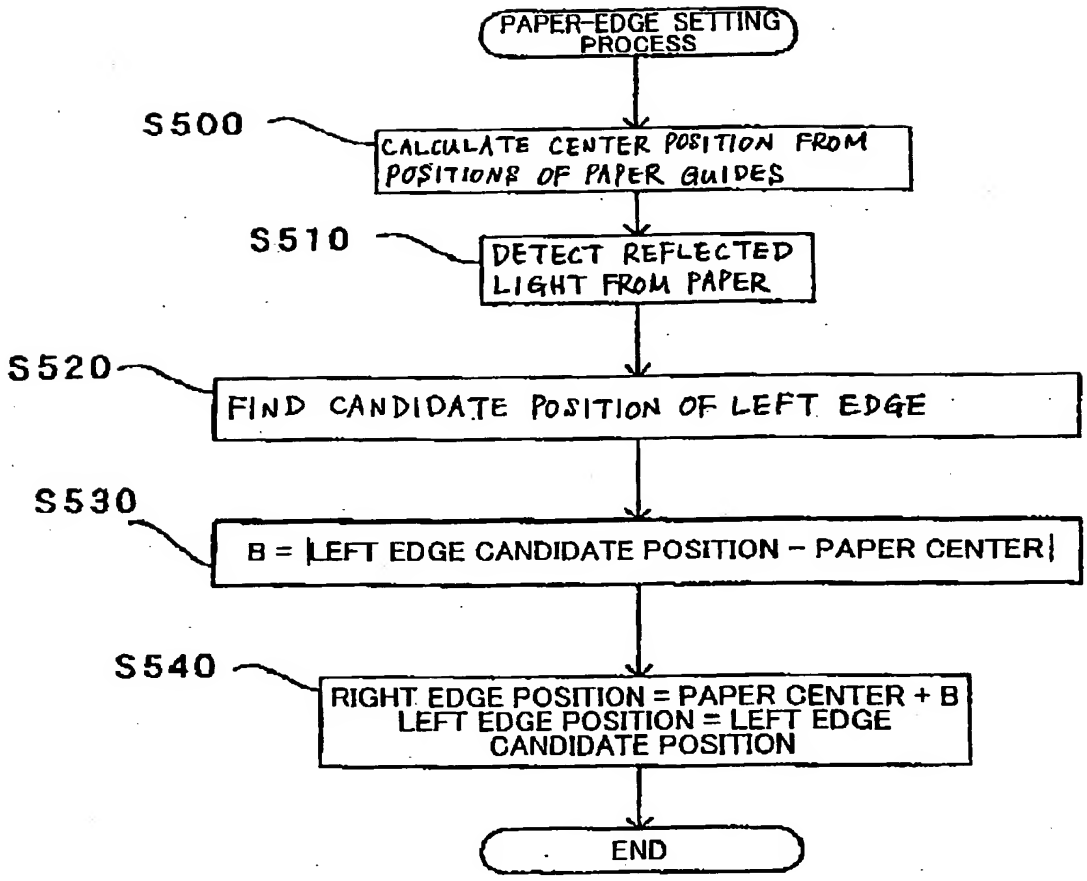

PAPER-EDGE SETTING PROCESS
S500
CALCULATE CENTER POSITION FROM POSITIONS OF PAPER GUIDES
S510
DETECT REFLECTED LIGHT FROM PAPER
S520
FIND CANDIDATE POSITION OF LEFT EDGE
S530
B = |LEFT EDGE CANDIDATE POSITION − PAPER CENTER|
S540
RIGHT EDGE POSITION = PAPER CENTER + B
LEFT EDGE POSITION = LEFT EDGE CANDIDATE POSITION
END

FIG.9

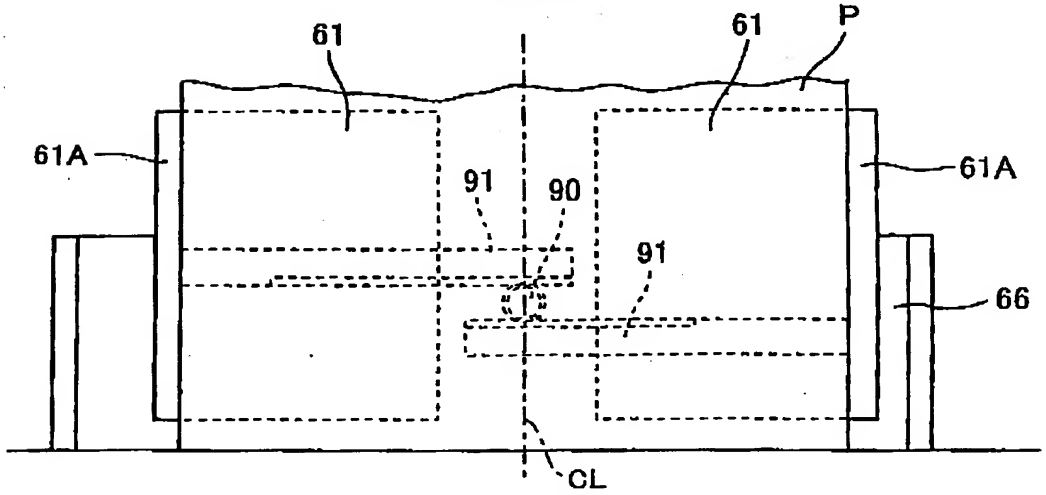

61
61
P
61A
61A
91
90
91
66
CL

FIG.10

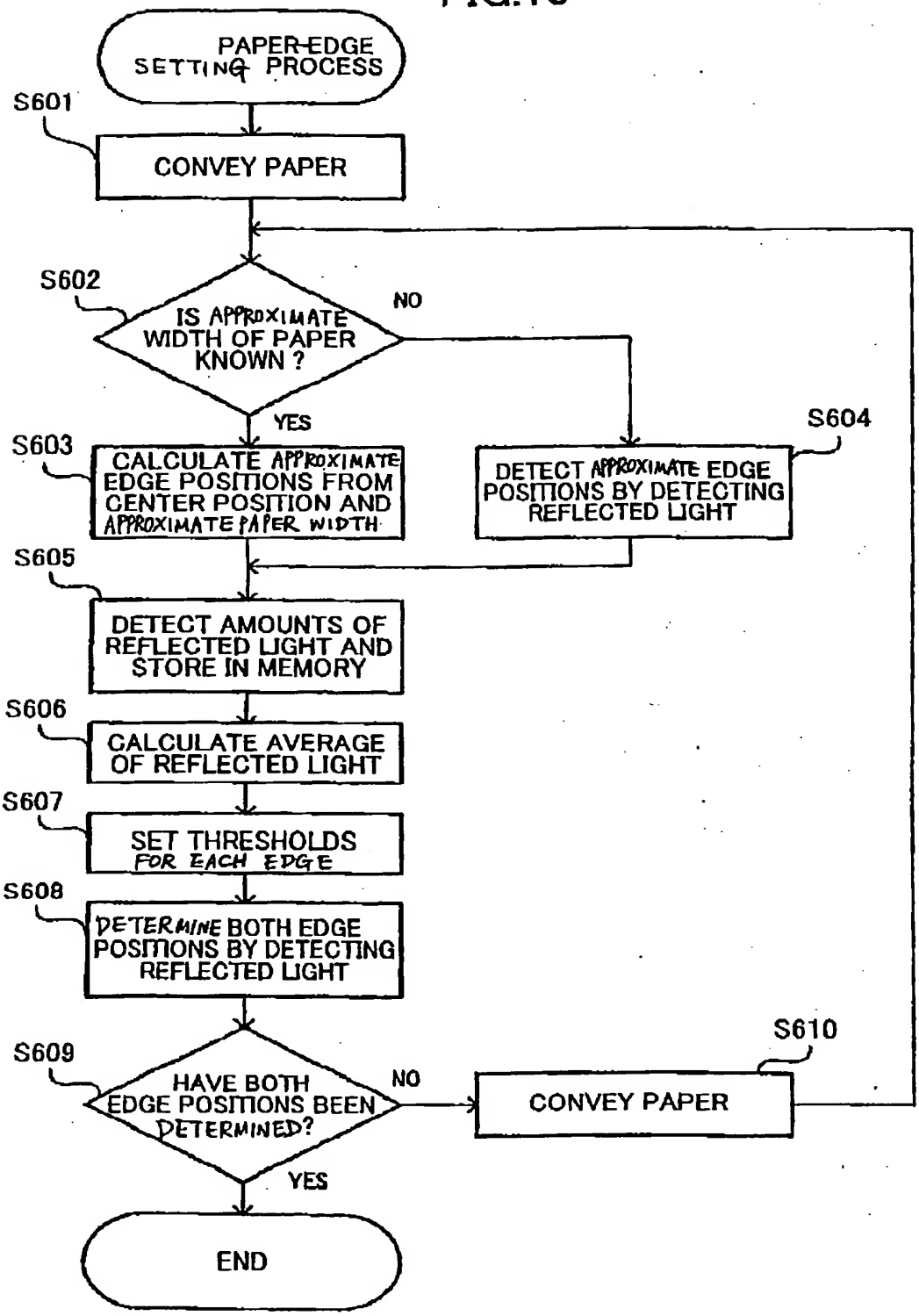

PAPER-EDGE SETTING PROCESS
S601
CONVEY PAPER
S602
IS APPROXIMATE WIDTH OF PAPER KNOWN ?
NO
YES
S603
CALCULATE APPROXIMATE EDGE POSITIONS FROM CENTER POSITION AND APPROXIMATE PAPER WIDTH
S604
DETECT APPROXIMATE EDGE POSITIONS BY DETECTING REFLECTED LIGHT
S605
DETECT AMOUNTS OF REFLECTED LIGHT AND STORE IN MEMORY
S606
CALCULATE AVERAGE OF REFLECTED LIGHT
S607
SET THRESHOLDS FOR EACH EDGE
S608
DETERMINE BOTH EDGE POSITIONS BY DETECTING REFLECTED LIGHT
S609
HAVE BOTH EDGE POSITIONS BEEN DETERMINED?
NO
S610
CONVEY PAPER
YES
END

FIG.11

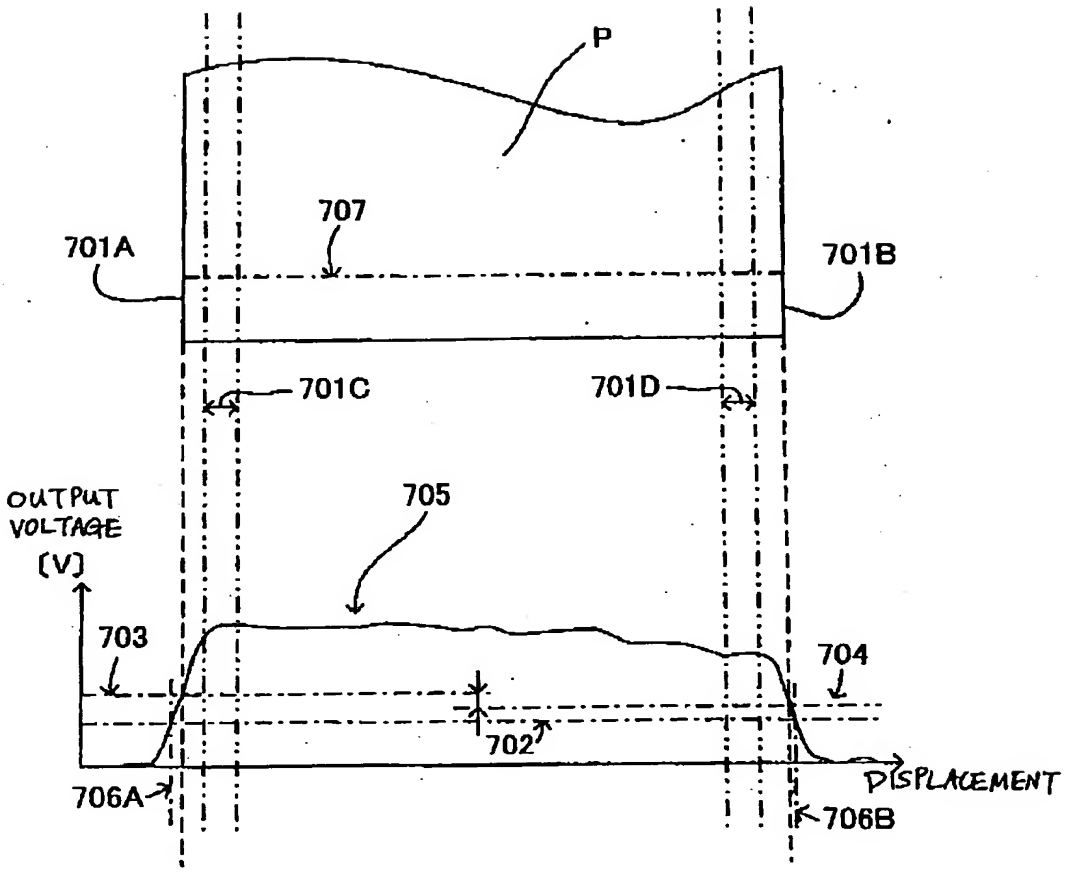
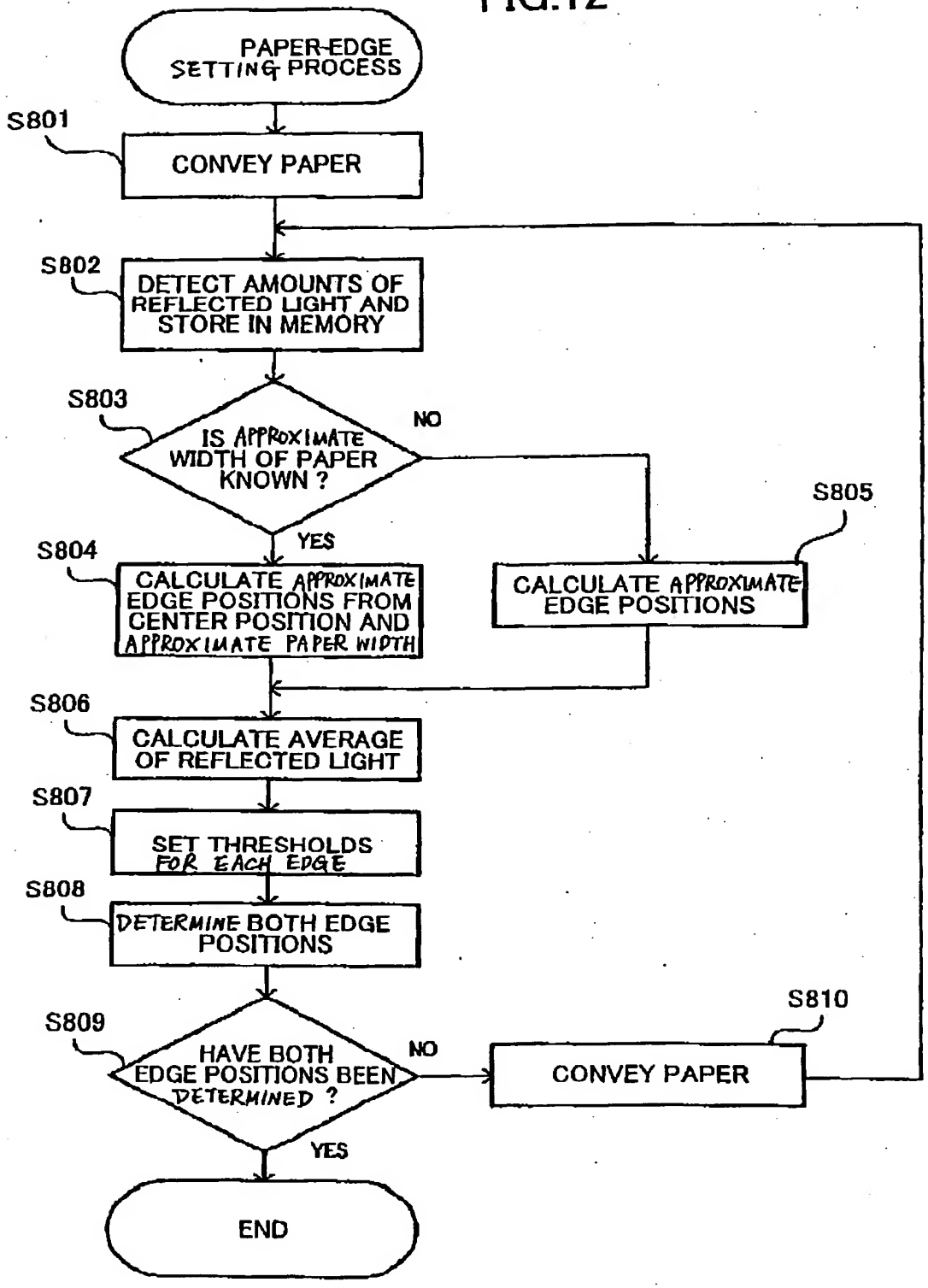

P
707
701A
701B
701C
701D
OUTPUT VOLTAGE [V]
705
703
704
702
706A
706B
DISPLACEMENT

FIG.12


PAPER-EDGE SETTING PROCESS
S801
CONVEY PAPER
S802
DETECT AMOUNTS OF REFLECTED LIGHT AND STORE IN MEMORY
S803
IS APPROXIMATE WIDTH OF PAPER KNOWN ?
NO
YES
S804
CALCULATE APPROXIMATE EDGE POSITIONS FROM CENTER POSITION AND APPROXIMATE PAPER WIDTH
S805
CALCULATE APPROXIMATE EDGE POSITIONS
S806
CALCULATE AVERAGE OF REFLECTED LIGHT
S807
SET THRESHOLDS FOR EACH EDGE
S808
DETERMINE BOTH EDGE POSITIONS
S809
HAVE BOTH EDGE POSITIONS BEEN DETERMINED ?
NO
YES
S810
CONVEY PAPER
END